

# PATENT ABSTRACTS OF JAPAN

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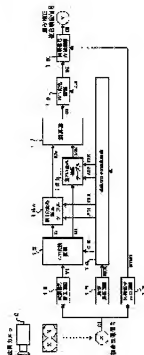
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## (54) WIDE-ANGLE DISTORTION CORRECTING DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain a wide-angle distortion correcting device capable of being applied to a simple monitoring camera or a video intercom.

**SOLUTION:** A 1st distortion correction table 16a converts a digital video signal D1 converted from an analog video signal V1 extracted from a composite video signal C1 obtained from a wide-angle camera C into an intermediate digital video signal D2a in accordance with the average distortion value of blocks in each block including the prescribed number of pixels and a multiplier 17 multiplies the signal D2a by a fine adjustment correction value D2b corresponding to pixels in a block outputted from a 2nd distortion correction table 16b to execute correction. Consequently the occupied capacity of a memory for storing distortion correction can drastically be reduced.



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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Description of the Prior Art]This invention relates to the small simple surveillance camera of memory space, and a wide-angle-distortion compensator applicable to a television intercom etc. especially with respect to a wide-angle-distortion compensator.

[0002]

[Problem(s) to be Solved by the Invention]Since what is a picture which transforms from the former the image picturized with the wide angle camera in a periphery, for example, has erection shape properly speaking curves in the direction of the central part and produces distortion in picture shape, In carrying out image processing of the video signal outputted from a wide angle camera, the video signal needed to be amended to every pixel (pixel) so that the picture of original erection shape might be reproduced. There were some which are shown in drawing 3 as a device which amends the distorsion of projected image picturized with such a wide angle camera.

[0003]As shown in a figure, a wide-angle-distortion compensator has the synchronized signal eliminating circuit 1 and the synchronized signal extracting circuit 2 which input the composite video signal ci sent out from wide angle camera C via the connector x, respectively, In the synchronized signal eliminating circuit 1, only the analog video signal vi is taken out and outputted from the composite video signal ci. On the other hand, in the synchronized signal extracting circuit 2, the synchronized signal sync is extracted from the composite video signal ci. The reference clock generating circuit 4 which outputs the synchronized signal sync which inputs the master clock signal mck from the local oscillation circuit 3, and is inputted from the synchronized signal extracting circuit 2 as the operation clock signal clk in sync with the master clock signal mck is connected to the output side of the synchronized signal extracting circuit 2.

[0004]The A/D conversion circuit 5 is connected to the output side of the synchronized signal eliminating circuit 1. The A/D conversion circuit 5 is further connected also to the output side of the reference clock generating circuit 4, and the analog video signal vi inputted from the synchronized signal eliminating circuit 1 is changed into the digital video signal d1 based on the operation clock signal clk from the reference clock generating circuit 4. The distortion correction table 6 where the calculation result of the distortion amount is stored for every pixel is established in the output side of the A/D conversion circuit 5, About the digital video signal d1 for every pixel outputted from the A/D conversion circuit 5, the index of the distortion amount corresponding to the operation clock signal clk and the addressing signal adr from the reference

clock generating circuit 4 is carried out, and amendment is carried out. For example, as shown in drawing 4, the pixel p1 is amended from the distortion correction table 6, and is outputted as digital video signal p1d1.

[0005]The D/A conversion circuit 7 connected to the output side of the reference clock generating circuit 4 is established in the output side of the distortion correction table 6, and the digital video signal d2 is changed into the analog video signal vo in the D/A conversion circuit 7 synchronizing with the operation clock signal clk from the reference clock generating circuit 4. The synchronized signal additional circuit 8 connected to the synchronized signal extracting circuit 2 is established in the output side of the D/A conversion circuit 7. The analog video signal vo from the D/A conversion circuit 7 and the synchronized signal sync from the synchronized signal extracting circuit 2 are compounded, the composite video signal co is formed, and it is outputted to the connector y.

[0006]Such a wide-angle-distortion compensator needs to prepare correction value for a distortion correction table to amend corresponding to all the pixels, When the occupation capacity of the memory for storing a table was large, and was not able to apply in a cheap surveillance camera, a television intercom, etc. but adopted a wide angle camera as such a surveillance camera, it had to be content with the picture which distortion produced being reproduced.

[0007]This invention was made in order to cancel the above-mentioned fault, and it is \*\*\*\*. The purpose is to provide a wide-angle-distortion compensator applicable to a surveillance camera, a television intercom, etc.

[0008]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a wide-angle-distortion compensator of this invention, In a wide-angle-distortion compensator which amends wide angle distortion by carrying out the index of the compensation table in which a calculation result of a distortion amount is beforehand stored in an image accompanied by wide angle distortion photoed with a wide angle camera, The 1st distortion correction table that a compensation table deduces the amount of distortion correction of an average of a field divided into square blocks of a predetermined number pixel, and outputs a digital video signal of middle correction value, It constitutes from the 2nd distortion correction table that outputs correction value equivalent to fine adjustment within a block of a square pixel of a predetermined number pixel, and has a multiplier which acquires a digital video signal by which multiplied correction value acquired on the 1st and 2nd distortion correction table, and distortion correction was carried out.

[0009]The 1st distortion correction table that in amending distortion of a picture in a wide angle camera divided into a block containing a pixel of a predetermined number, and computed a distortion amount of an average of the field beforehand for every block, The 2nd distortion correction table that computed beforehand a distortion amount for tuning finely according to a pixel contained in a block is provided, the multiplication of a correction amount deduced by carrying out the index of the 1st distortion correction table and the correction amount produced by carrying out the index of the 2nd distortion correction table is carried out, and a digital video signal is amended. For this reason, since the full screen can be amended by having memory space according to the block count and the number of pixels contained in a block, Occupation capacity of a memory can be reduced substantially, it can apply to a small simple surveillance camera of memory space, a television intercom, etc., and a proper reproduced image of an image

picturized with a wide angle camera can be obtained.

[0010]

[Embodiment of the Invention] One example which applied the wide-angle-distortion compensator of this invention is described with reference to drawings. Composite video signal CI outputted from wide angle camera C has the synchronized signal eliminating circuit 11 and the synchronized signal extracting circuit 12 which are inputted via the connector X, respectively, and, as for the wide-angle-distortion compensator shown in drawing 1, analog video signal VI is taken out in the synchronized signal eliminating circuit 11. On the other hand, the synchronized signal SYNC is extracted in the synchronized signal extracting circuit 12. In [ the reference clock generating circuit 14 connected also to the output side of the local oscillation circuit 13 is established in the output side of the synchronized signal extracting circuit 12, and ] the reference clock generating circuit 14, The synchronized signal SYNC inputted from the synchronized signal extracting circuit 12 based on the master clock signal MCK inputted from the local oscillation circuit 13 is outputted as the operation clock signal CLK. The A/D conversion circuit 15 connected to the output side of the reference clock generating circuit 14 is connected to the output side of the synchronized signal eliminating circuit 11, Analog video signal VI outputted from the synchronized signal eliminating circuit 11 based on the operation clock signal CLK from the reference clock generating circuit 14 in the A/D conversion circuit 15 is changed into the digital video signal D1 divided into the pixel.

[0011] The 1st distortion correction distortion correction table [ 2nd ] 16a and 16b which are connected also to the output side of the reference clock generating circuit 14, respectively are established in the output side of the A/D conversion circuit 15. The full screen is divided into square-blocks B which has the pixel P of a predetermined number as shown in drawing 2 in the 1st distortion correction table 16a, For example, the calculation result which computed beforehand the distortion amount of the average of the pixel P which divides into 8x8 and is contained in the block B at every (a) and each block B is stored according to the address of a block. On the 1st distortion correction table 16a, with the digital video signal D1 from the A/D conversion circuit 15. If the operation clock CLK and block addressing signal AD1 are inputted from the reference clock generating circuit 14, the intermediate digital video signal D2a of the middle correction value which carried out the index of the stored distortion calculation result, and amended the digital video signal D1 will be outputted. As for the amended intermediate digital video signal D2a, the position was amended according to each block B (b). The predetermined number contained in the block B in the 2nd distortion correction table 16b, For example, the calculation result of the distortion amount within the block B (c) is stored in each pixel P of every [ of 8x8 ] according to the address, and on the 2nd distortion correction table 16b with the digital video signal D1 from the A/D conversion circuit 15. If the operation clock CLK from the reference clock generating circuit 14 and pixel addressing signal AD2 are inputted, the index of the stored distortion calculation result will be carried out, and correction value D2b for tuning the position of each pixel P within a block finely will be outputted.

[0012] The intermediate digital video signal D2a which the multiplication machine 17 was connected to the output side of the distortion correction distortion correction table 16a and 16b, and was inputted into the multiplier 17, The distortion correction digital video signal D3 with which the original picture shape which distortion correction completed is reproduced is formed by multiplying correction value D2b (d). The D/A conversion circuit 18 connected also to the output side of the reference clock generating circuit 14 is established in the output side of the multiplier 17 -- the distortion correction digital video signal D3 inputted

into the D/A conversion circuit 18 is changed into the distortion correction analog video signal VO synchronizing with the operation clock signal CLK. The synchronized signal additional circuit 19 connected also to the output side of the synchronized signal extracting circuit 12 is established in the output side of the D/A conversion circuit 18, The distortion correction analog video signal VO and the synchronized signal SYNC which are inputted from the D/A conversion circuit 18 are compounded, and distortion correction composite video signal CO is outputted to the connector Y.

[0013]In such a wide-angle-distortion compensator, if composite video signal CI is inputted into the synchronized signal extracting circuit 12 and the synchronized signal eliminating circuit 11 via the connector X from wide angle camera C, In the synchronized signal extracting circuit 12, the synchronized signal SYNC is taken out from composite video signal CI, and it is outputted to the reference clock generating circuit 14. The operation clock signal CLK formed based on the master clock signal MCK from the local oscillation circuit 13 in the reference clock generating circuit 14 is outputted to the A/D conversion circuit 15, the 1st distortion correction table 16a, the 2nd distortion correction table 16b, and the D/A conversion circuit 18, respectively. On the other hand, the analog video signal taken out from composite video signal CI in the synchronized signal eliminating circuit 11 is changed into the digital video signal D1 in the A/D conversion circuit 15 synchronizing with the operation clock signal CLK. At this time, the picture by the digital video signal D1 serves as the shape Z0 where original erected body shape was distorted, for example, as shown in drawing 2 (a). Such a digital video signal D1 is the 1st. It is outputted to the distortion correction table 16a and the 2nd distortion table 16b, respectively. The 1st In the distortion correction table 16a, the digital video signal D1 synchronizes with the operation clock signal CLK from the reference clock generating circuit 14, and is amended according to the distortion amount stored in the address of the block B specified by addressing signal AD1. As shown in drawing 2 (b), it is outputted to the multiplication machine 17 as the intermediate digital video signal D2a with which amendment was carried out. Amendment of the fine adjustment according to the distortion amount stored in the address of the pixel P which is based on the inputted digital video signal D1 in the 2nd distortion table 16b on the other hand, and is specified by pixel addressing signal AD2 within the block from the reference clock generating circuit 14 is carried out, The picture shape Z1 (drawing 2 (c)) is outputted to the multiplication machine 17 synchronizing with the operation clock signal CLK. In the multiplier 17, the intermediate digital video signal D2a and correction value D2b are multiplied, and picture shape Z0 is made into the original picture shape Z2 as shown in drawing 2 (d). Thus, in the D/A conversion circuit 18, analogue conversion is carried out synchronizing with the operation clock signal CLK from the reference clock generating circuit 14, and the distortion correction digital video signal D3 with which distortion produced in a picture periphery was amended is made into the distortion correction analog video signal VO, and further, In the synchronized signal additional circuit 19, it is compounded with the synchronized signal SYNC from the synchronized signal extracting circuit 12, is referred to as distortion correction composite video signal CO, and is outputted to the connector Y. Then, as shown in drawing 2 (e), it is considered as the shape which deletes a periphery and is shown with a dashed line.

[0014]Although two distortion correction tables are prepared and distortion correction of a single step is performed in the above-mentioned example, respectively, Even if the invention in this application is not limited to this but it provides a distortion correction table three or more, Even if it establishes either or each distortion correction table in multistage, it can apply suitably if needed, and it can apply also to the wide

angle camera which uses an ultra wide angle lens and a special lens like a fish-eye lens.

[0015]

[Effect of the Invention] Since the wide-angle-distortion compensator of the invention in this application established the distortion correction table in two steps, it can reduce the memory occupation capacity to distortion correction substantially, so that clearly also from the above-mentioned explanation. For this reason, it can apply to the small television intercom and surveillance camera of memory space, and a normal picture can be acquired also in these.

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[Translation done.]